

What is claimed is:

1. A method for providing stream data to a client, the method comprising the steps of:

monitoring operation of a stream control protocol associated with stream data

5 transmitted between a client and a first stream server;

detecting a stream change event related to transmission of the stream data  
between the client and the first stream server;

identifying a relative position within the stream data based on the monitored  
operation of the stream control protocol; and

10 establishing transmission of the stream data between the client and a second  
stream server starting at the relative position in the stream data.

2. The method of claim 1 wherein the step of monitoring operation of a stream control  
protocol comprises the steps of:

15 intercepting a stream adjustment message of the stream control protocol, the  
stream adjustment message indicating an adjustment to a transmission characteristic of  
the stream data; and

updating a stream state associated with the stream data based on the stream  
adjustment message.

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3. The method of claim 2 wherein the step of identifying a relative position within the  
stream data comprises the step of:

calculating the relative position within the stream data based on the updated  
stream state, the relative position indicating a current location in the stream data relative  
25 to a predetermined location in the stream data and corresponding to a position in the  
stream data at which to begin transmission between the client and the second stream  
server upon establishing transmission of the stream data between the client and a second  
stream server.

4. The method of claim 3 wherein the stream adjustment message includes relative position information and wherein the step of updating a stream state comprises the steps of:

storing the relative position information in the stream state associated with the stream data.

5. The method of claim 3 wherein:

the steps of identifying a relative position within the stream data and establishing transmission of the stream data between the client and a second stream server are performed in response to the step of detecting a stream change event related to the first stream server; and

wherein the relative position within the stream data is a normal play time of the stream data identifying a time position within the stream data at which the step of establishing transmission of the stream data causes transmission of the stream data to be resumed between the client and the second stream server.

6. The method of claim 3 wherein:

the stream adjustment message is a current stream adjustment message that indicates a bandwidth adjustment to a bandwidth of transmission of the stream data between the client and the first stream server; and

wherein the step of updating a stream state associated with the stream data comprises the steps of:

calculating a current amount of stream data transmitted between the client and the first stream server from a time between receipt of a former stream adjustment message until receipt of the current stream adjustment message;

calculating an current normal play time associated with the stream data based on the current amount of stream data and a value of a bandwidth adjustment of the former stream adjustment message;

adding the current normal play time to a cumulative normal play time maintained within the stream state associated with the stream data; and

storing the cumulative normal play time in the stream state associated with the stream data.

7. The method of claim 6 wherein:

5 the steps of identifying a relative position within the stream data and establishing transmission of the stream data between the client and a second stream server are performed in response to the step of detecting a stream change event related to the first stream server;

10 the step of calculating the relative position within the stream data based on the updated stream state comprises the steps of:

calculating a current amount of stream data transmitted between the client and the first stream server from a time between receipt of the current stream adjustment message until detection of the stream change event;

15 calculating a current normal play time associated with the stream data based on the current amount of stream data and a value of a bandwidth adjustment of the current stream adjustment message; and

20 adding the current normal play time to the cumulative normal play time to produce the relative position with the stream data, the relative position reflecting an elapsed time position within the stream data that coincides with the stream change event.

8. The method of claim 7 wherein the step of establishing transmission of the stream data between the client and a second stream server starting at the relative position in the stream data comprises the steps of:

25 identifying a second stream server that can handle transmission of the stream data with the client; and

30 providing a stream establishment message to the second stream server, the stream establishment message indicating that the second stream server is to establish transmission of the stream data between the client and the second stream server beginning at the relative position in the stream data.

9. The method of claim 7 wherein the stream data is transmitted from the first stream server to the client and wherein the step of detecting a stream change event comprises the step of:

5           detecting a failure of the ability of the first stream server to transmit the stream data to the client.

10. The method of claim 7 wherein the stream data is transmitted from the first stream server to the client and wherein the step of detecting a stream change event comprises the step of:

          detecting that the first stream server indicates an overload of serving stream data; and

          wherein the steps of identifying a relative position within the stream data and establishing transmission of the stream data between the client and a second stream server cause the transmission of stream data to be migrated from between the client and the first stream server to between the client and the second stream server.

11. The method of claim 7 wherein the step of detecting a stream change event comprises the step of:

20           detecting a stream change indicator within the stream data transmitted between the client and the first stream server.

12. The method of claim 7 wherein the steps of calculating a current amount of stream data transmitted between the client and the first stream server comprise the step of:

25           calculating an amount of stream data transmitted between the client and the first stream server while accounting for overhead conditions in the stream data.

13. The method of claim 1 wherein the stream data comprises multiple flows of data and wherein the step of identifying a relative position within the stream data comprises the

step of identifying respective relative positions within the stream data for each flow of data.

14. The method of claim 1:

5            wherein the stream data is real time data transmitted from the first stream server to the client;

          wherein the stream control protocol is a real time data transfer control protocol capable of allowing the client and the first stream server to control the flow of the stream data such that the client can receive the stream data from the first stream server in a real-  
10    time manner; and

          wherein the steps of monitoring, detecting, identifying and establishing are performed to:

          i) allow a stream change event to cause transmission of the stream data to switch between the first stream server and the client to the second stream server and the  
15    client; and

          ii) to begin transmission of the stream data from the second stream server to the client at the relative position which corresponds approximately to a time location in the stream data that corresponds to the stream change event.

20    15. A computerized device comprising:

          at least one communications interface;

          a memory;

          a processor; and

          an interconnection mechanism coupling the at least one communications  
25    interface, the memory and the processor;

          wherein the memory is encoded with a failover manager application that when performed on the processor, produces a failover manager process that causes the computerized device to enable stream data to be provided to a client by performing the operations of:

monitoring operation of a stream control protocol associated with stream data transmitted between a client and a first stream server;

detecting a stream change event related to transmission of the stream data between the client and the first stream server;

5 identifying a relative position within the stream data based on the monitored operation of the stream control protocol; and

establishing transmission of the stream data between the client and a second stream server starting at the relative position in the stream data.

10 16. The computerized device of claim 15 wherein when the failover manager process performs the operation of monitoring operation of a stream control protocol the failover manager process performs the operations of:

intercepting a stream adjustment message of the stream control protocol, the stream adjustment message indicating an adjustment to a transmission characteristic of the stream data; and

15 updating a stream state associated with the stream data based on the stream adjustment message.

20 17. The computerized device of claim 16 wherein when the failover manager process performs the operation of identifying a relative position within the stream data the failover manager process performs the operation of :

calculating the relative position within the stream data based on the updated stream state, the relative position indicating a current location in the stream data relative to a predetermined location in the stream data and corresponding to a position in the stream data at which to begin transmission between the client and the second stream server upon establishing transmission of the stream data between the client and a second stream server.

25 18. The computerized device of claim 17 wherein the stream adjustment message includes relative position information and wherein when the failover manager process

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performs the operation of updating a stream state, the failover manager process performs the operation of:

storing the relative position information in the stream state associated with the stream data.

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19. The computerized device of claim 17 wherein:

the operations of identifying a relative position within the stream data and establishing transmission of the stream data between the client and a second stream server are performed by the failover manager process in response to the operation of detecting a stream change event related to the first stream server; and

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wherein the relative position within the stream data is a normal play time of the stream data identifying a time position within the stream data at which the operation of establishing transmission of the stream data causes transmission of the stream data to be resumed between the client and the second stream server.

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20. The computerized device of claim 17 wherein:

the stream adjustment message is a current stream adjustment message that indicates a bandwidth adjustment to a bandwidth of transmission of the stream data between the client and the first stream server; and

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wherein when the failover manager process performs the operation of updating a stream state associated with the stream data the failover manager process performs the operations of:

calculating a current amount of stream data transmitted between the client and the first stream server from a time between receipt of a former stream adjustment message until receipt of the current stream adjustment message;

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calculating an current normal play time associated with the stream data based on the current amount of stream data and a value of a bandwidth adjustment of the former stream adjustment message;

adding the current normal play time to a cumulative normal play time maintained within the stream state associated with the stream data; and

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storing the cumulative normal play time in the stream state associated with the stream data.

21. The computerized device of claim 20 wherein:

5           the operations of identifying a relative position within the stream data and establishing transmission of the stream data between the client and a second stream server are performed in response to the operation of detecting a stream change event related to the first stream server; and

10           wherein when the failover manager process performs the operation of the calculating the relative position within the stream data based on the updated stream state, the failover manager process performs the operations of:

          calculating a current amount of stream data transmitted between the client and the first stream server from a time between receipt of the current stream adjustment message until detection of the stream change event;

15           calculating a current normal play time associated with the stream data based on the current amount of stream data and a value of a bandwidth adjustment of the current stream adjustment message; and

20           adding the current normal play time to the cumulative normal play time to produce the relative position with the stream data, the relative position reflecting an elapsed time position within the stream data that coincides with the stream change event.

22. The computerized device of claim 21 wherein when the failover manager process performs the operation of establishing transmission of the stream data between the client and a second stream server starting at the relative position in the stream data the failover manager process performs the operation of:

          identifying a second stream server that can handle transmission of the stream data with the client; and

30           providing a stream establishment message to the second stream server, the stream establishment message indicating that the second stream server is to establish



transmission of the stream data between the client and the second stream server beginning at the relative position in the stream data.

23. The computerized device of claim 21 wherein the stream data is transmitted from the first stream server to the client and wherein when the failover manager process performs the operation of detecting a stream change event the failover manager process performs the operation of:

detecting a failure of the ability of the first stream server to transmit the stream data to the client.

24. The computerized device of claim 21 wherein the stream data is transmitted from the first stream server to the client and wherein when the failover manager process performs the operation of detecting a stream change event the failover manager process performs the operation of:

detecting that the first stream server indicates an overload of serving stream data; and

wherein the operations of identifying a relative position within the stream data and establishing transmission of the stream data between the client and a second stream server cause the transmission of stream data to be migrated from between the client and the first stream server to between the client and the second stream server.

25. The computerized device of claim 21 wherein when the failover manager process performs the operation of detecting a stream change event the failover manager process performs the operation of:

detecting a stream change indicator within the stream data transmitted between the client and the first stream server.

26. The computerized device of claim 21 wherein when the failover manager process performs the operation of calculating a current amount of stream data transmitted

between the client and the first stream server, the failover manager process performs the operation of:

calculating an amount of stream data transmitted between the client and the first stream server while accounting for overhead conditions in the stream data.

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27. The computerized device of claim 15 wherein the stream data comprises multiple flows of data and wherein when the failover manager process performs the operation of identifying a relative position within the stream data the failover manager process performs the operation of identifying respective relative positions within the stream data for each flow of data.

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28. The computerized device of claim 15:

wherein the stream data is real time data transmitted from the first stream server to the client;

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wherein the stream control protocol is a real time data transfer control protocol capable of allowing the client and the first stream server to control the flow of the stream data such that the client can receive the stream data from the first stream server in a real-time manner; and

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wherein when the failover manager process performs the operations of monitoring, detecting, identifying and establishing, the failover manager process performs such operations to:

i) allow a stream change event to cause transmission of the stream data to switch between the first stream server and the client to the second stream server and the client; and

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ii) to begin transmission of the stream data from the second stream server to the client at the relative position which corresponds approximately to a time location in the stream data that corresponds to the stream change event.

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29. A computer program product having a computer-readable medium including computer program logic encoded thereon that, when performed on a processor in a

computerized device having a coupling of a memory, a processor, and at least one communications interface provides a method for providing stream data to a client by performing the operations of:

monitoring operation of a stream control protocol associated with stream data  
5 transmitted between a client and a first stream server;  
detecting a stream change event related to transmission of the stream data  
between the client and the first stream server;  
identifying a relative position within the stream data based on the operation of the  
stream control protocol; and  
10 establishing transmission of the stream data between the client and a second  
stream server starting at the relative position in the stream data.

30. A computerized device comprising:

at least one communications interface;  
15 a memory;  
a processor; and  
an interconnection mechanism coupling the at least one communications  
interface, the memory and the processor;  
wherein the memory is encoded with a failover manager application that when  
20 performed on the processor, produces a means to enable stream data to be provided to a  
client, such means including:

means for monitoring operation of a stream control protocol associated with  
stream data transmitted between a client and a first stream server;  
means for detecting a stream change event related to transmission of the stream  
25 data between the client and the first stream server;  
means for identifying a relative position within the stream data based on the  
monitored operation of the stream control protocol; and  
means for establishing transmission of the stream data between the client and a  
second stream server starting at the relative position in the stream data.